Figure 1: The hand geometry system in use at the Shiloh-Scott MetroLink entrance

Biometric Success at Scott AFB

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Executive Summary

In a long-term test of biometric technology, Scott Air Force Base (AFB) is using a hand geometry system to improve base access through its Shiloh-Scott MetroLink rail station entrance. A team of experts from the Department of Defense (DoD) Biometrics Fusion Center and West Virginia University recently visited Scott AFB to assess the hand geometry system's first year of operation. The team found that the system had not only performed well but has also saved money and manpower. Scott AFB considers the biometric implementation a success.

Introduction

The mission of Scott AFB is global mobility. As such, Scott AFB is home to the U.S. Transportation Command, Air Mobility Command, 18th Air Force, and the Air Force Communications Agency (AFCA). Located on nearly 3,600 acres near St. Louis, MO, the base employs more than 13,000 military and civilian personnel.

In light of its critical mission and the large number of personnel who work at the installation or use its facilities, Scott AFB places a high premium on access control.

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Figure 2: Close-up of the Shiloh-Scott MetroLink turnstile entrance

Accordingly, in 2003, the base eagerly participated in a pilot project partially underwritten by the DoD Biometrics Management Office (BMO). Scott AFB acquired a biometric system to control base access at the new rail station entrance, which provides direct access to the base. See Figure 1.

Scott AFB sought a system that could provide fast throughput, high reliability, and ease of use, and could be acquired, installed, and maintained at a reasonable cost. Ultimately, Scott AFB selected a hand geometry system that uses a combination of an enrolled user's hand geometry with a personal identification number (PIN). This approach provides two-factor authentication (PIN and biometric).

The Hand Geometry System

The MetroLink access point, shown in Figure 2, uses a HandKey II hand geometry reader at each of two turnstiles. Hurricane enclosures protect the devices from bad weather, and integrated heaters protect gloveless users from the cold. See Figure 3.

One of the turnstiles is large enough to accommodate wheelchairs and individuals carrying large or bulky items. Authentication begins when a user enters a six-digit PIN, which points to the enrolled biometric template, and then places a hand on the reader's platen. Access is granted when the system determines that the stored template matches the hand on the platen. To leave the base, individuals move through one-way gates without presenting their biometric or identification card.

About DoD Biometrics

The Department of Defense (DoD) Biometrics Management Office (BMO) leads the effort to adopt and institutionalize biometric technologies across the DoD. As the operational arm of the BMO, the Biometrics Fusion Center (BFC) performs test and evaluation of commercially available biometric technologies and provides technical implementation and integration support to DoD organizations. The BMO and BFC are both actively involved in supporting the Global War on Terrorism and developing biometric standards.
The BMO reports to the Army Chief Information Officer (CIO/G-6) who acts on behalf of the DoD Executive Agent for Biometrics, the Secretary of the Army. To learn more about DoD Biometrics, please visit www.biometrics.dod.mil

To enroll users in the system, an implementation team from HQ AFCA visited various locations across the base, including the Base Exchange, hospital, and other major unit buildings. Over a period of 30 days, the team prepared to enroll over 10,000 users who would use the MetroLink rail station entrance. The team collected data—including user name, status (e.g., retired, active, reserve), organization (e.g., AFCA, Security Forces Group), and

Figure 3: Hand Geometry device with hurricane enclosure

Figure 4: Shiloh-Scott MetroLink entrance guard/ call station

phone number—for a database. The team also enrolled MetroBus and MetroLink drivers—with access time restrictions—in the system.

An individual enrolls in the system by first verifying his or her identity. A PIN is automatically generated from the user's Social Security Number. The individual next places his or her hand on a hand geometry reader's platen three times to register a three-dimensional reading of the size and shape of the hand in the form of a nine-byte template. The enrollment procedure requires no other information, and takes less than two minutes to complete.

Anyone who has a problem with the hand geometry device can still gain access to the station or base by using a call box to contact the Security Police. The user then displays his or her ID card so that security personnel can verify his or her identity via a closed-circuit security camera. See Figure 4. The security personnel then flip a switch to allow the turnstile to be opened manually. Because of this exception handling procedure, no authorized individuals are ever locked out of the base because of a problem with the biometric devices.

System Performance

The Scott AFB implementation team analyzed June-September 2003 performance data collected from the hand geometry readers. Although this analysis was not a formal evaluation, its findings are nonenthless helpful. During that 90-day test period, the system performed well, according to the following criteria:

Uptime: The percentage of time that the system is available to users. During the test period, the system operated at an uptime rate of 100 percent.

Enrollment time: The amount of time required to successfully complete an enrollment. Average time for enrollment of a new user was approximately 2 minutes, and it took less than 2 minutes on average to re-enroll a user (e.g., when someone forgot his or her PIN or needed to enroll a second hand.)

Failure-to-enroll rate: The rate of users for whom it was not possible to obtain a satisfactory enrollment of one or more biometric templates. The hand geometry system had 0 percent failure-to-enroll rate.

Access rate: How often a user could gain entry with three or fewer placements of his or her hand on the platen. During the test period, the system achieved an access rate of 97.3 percent.

False reject rate: How often a problem with the device or its use causes the system to reject access to an authorized user. The false reject rate was 2.69 percent during the test period and has declined to 2.1 percent as users become more accustomed to the system. If necessary, the user can work around a false re-

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jection by presenting his or her hand again, or by using a call button to get help from Security Police.

There were no reported instances of a false accept, i.e., a non-enrolled individual successfully using the hand geometry device. During the demonstration phase, several individuals tried to put in another user's PIN and then place their hands on the platen; in all observed cases, the system blocked the individual's access.

Cost Benefit Analysis

In 2004, a team of West Virginia University (WVU) researchers reviewed the biometric application at Scott AFB. The team determined that the system could save the Air Force as much as $412,000 over five years. They pegged the estimated cost of the hand geometry system at $148,000 over five years, including expenses for maintenance and equipment upgrades. Of the estimated savings, a significant portion was derived from the redeployment of security guards.

Apart from these specific, identifiable potential savings, the researchers also noted a marked increase in anomaly security monitoring associated with this project. By relieving them from repetitive, mundane tasks such as badge monitoring, the Scott AFB guards are available to deal with other important security issues. The researchers believed that the hand geometry system was equal to or better at access control than a human security guard, and, further, that security guards were far better assigned to unstructured problem- solving issues such as security detection through such tasks such as monitoring the perimeters of the Scott AFB. Other unquantifiable benefits of the hand geometry system included improvements in speed of entry, ease of access and use, and simplicity of access for the users.

The WVU researchers determined that the Scott AFB hand geometry application provides a "best practice" that may be pursued by other military bases interested in controlling access with biometrics.

Conclusion

Scott AFB considers the biometric implementation a success because the system has proven to be accurate, reliable, and easy to use. The hand geometry system has allowed Scott AFB to save money and use manpower resources more efficiently.

Scott AFB representatives plan to continue using the biometric devices. Moreover, they would not only consider future biometric implementations at Scott AFB, but also would recommend the use of biometric technology to other DoD organizations.